

PATENT OFFICE

NARROW WEB CORONA TREATER

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30 The corona treater also has mounting plate structure which connects
the corona treating equipment to the frame of the label press. A front mounting
plate normally supports the treater roll as well as a pair of web guide rolls and an
electrode support tube, and provides the necessary alignment to reduce wrinkles
and twisting of the web. In the past narrow web designs, the rolls were
35 cantilevered from a single mounting plate or supported to permanently mounted
plates at each end of the treater. The cantilevered design would not provide the
mechanical strength for the longer treat width system and the two-plate design
made installation difficult and more specifically designed for a particular press
manufacturer.

40 The corona treating system further includes a mechanism to thread
the web through the treater system and in addition, a method of cleaning the
electrode assembly and performing maintenance. In the past, the electrode
magazine would normally fasten to the electrode support tube and require the
assembly to be rotated away from the treater roll before the magazine could be
45 moved or cleaned. This method is very costly and takes up additional machine
space for the pivoting of the electrode assembly.

The corona treater additionally has a mechanism which is used to
adjust the gap between the high voltage electrodes and the treater roll. In past
systems, this adjustment was normally accomplished with an adjustment device
50 located on each end of the electrode assembly which raises and lowers the electrode
depending on how far the adjustment device was turned. This type of adjustment
did not provide consistent gap adjustment on both ends of the electrode assembly
and requires a gapping gauge to set the proper distance between the electrode and
the treater roll.

55 Accordingly, it is desirable to rectify the shortcomings of prior art
constructions by providing a corona treater having a fast and simple, high voltage
connection between the electrodes and high voltage source and which can be easily
disconnected from the corona treater making removal of the electrode magazine
safer and quicker. It is also desirable to provide a corona treater having a mounting

60 plate design with the ability to adjust the frame to the type of press it was being
mounted to allowing for a standard machine design for all presses. There is a need
for a corona treater having a simple mechanism to support the electrode magazine
which can easily slide out partially to allow webbing of the treater roll or can be
completely removed for maintenance and cleaning. Likewise, there is a need for a
65 corona treater having a single adjustment device at the front end of the treater
system which is easily accessible to the operator. Such a single device when
operated will adjust the electrode gap evenly across the treater roll surface and
prevent uneven treatment levels due to improper adjustment.

SUMMARY OF THE INVENTION

70 It is a general object of the present invention to provide a corona
treater which allows printers to produce high quality print on most any web or
substrate.

It is one object of the present invention to provide a combined corona
treater and power supply which will enable quick installation, easy operation, faster
75 press speeds and increased productivity.

It is also an object of the present invention to provide a corona treater
having an affordable, compact design with low maintenance.

In accordance with one aspect of the invention, a corona treater is
provided with structure for permitting slidable mounting of the electrode magazine
80 relative to the support tube.

In another aspect of the invention, a corona treater is provided with
structure for enabling adjustment of the gap between the treater roll and the
electrode magazine.

In yet another aspect of the invention, the corona treater provides for
85 modular mounting to a variety of printing presses.

In still another aspect of the invention, the corona treater provides for
a safe, spring-biased electrical connection between the electrodes and a high
voltage source.

In one aspect of the invention, a corona discharge device is adapted to
90 be used in conjunction with a printing press. The device includes a cabinet housing
and on-board power supply associated with a high voltage transformer. A rear end
plate depends from the cabinet, and a front end plate spaced apart in parallel
relationship from the rear end plate also depends from the cabinet. An electrode
support tube is fixedly mounted in the cabinet and has an electrode magazine
95 slidably mounted on the support tube between an operative position and an
inoperative position. The magazine includes a series of parallel electrodes. A
grounded treater roll is rotatably mounted on a first shaft between the rear end plate
and the front end plate and below the support tube. A pair of spaced idler rolls is
rotatably mounted on respective second and third shafts between the rear end plate
100 and the front end plate below the treater roll such that a flexible web is guided
upwardly by the idler rolls and wound about the treater roll beneath the electrodes.
The high voltage transformer includes a high voltage wire terminating in a high
voltage connection for establishing a high voltage field between the electrodes and
the treater roll. A high voltage connection includes a pair of non-conductive
105 spacers projecting rearwardly from the rear end plate, a connector plate joining the
spacers, a spring loaded screw connected to the high voltage wire and extending
forwardly from the connector plate, and a conductive bus bar connected to the rear
end of the electrodes and engagable with the screw when the magazine is in the
operative position. A lower slide support is mounted between a bottom of the
110 cabinet and a top of the support tube. The front end plate is slidably adjustable
along the slide support and the first, second and third shafts to define a universal
mounting device adapted to fit various frames of the printing press. A grooved
slide track is secured for slidable movement to opposing sides of the support tube,
and a pair of slide rails is mounted on the magazine such that the rails align with
115 the grooved slide tracks to slidably support the magazine on the support tube. The
front of the magazine includes a rotatable handle having a latch engagable with a
suitable opening in the bottom of the support tube for holding the magazine in the
operative position. The magazine includes detent structure engagable with the

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support tube for preventing and permitting slidable removal of the magazine from
120 the support tube. The slide tracks include slot structure enabling the slide tracks
when moved back and forth to simultaneously move up and down so that the
magazine will be incrementally raised or lowered to enable an adjustment of a gap
between the treater roll and the magazine. An adjustment device is mounted on a
front of the support tube, the adjustment device including a rotatable knob having a
125 rod tightly screw threaded into a cover plate on the support tube whereby
unscrewing of the knob will permit the slide tracks to move back and forth as well
as up and down.

In another aspect of the invention, a corona discharge device is
provided for corona discharge treatment of continuous webs. The device has a
130 front end plate and a rear end plate spaced from the front end plate in parallel
relationship therewith. An electrode support tube is mounted on the front end plate
for supporting an electrode magazine having a series of electrodes associated with a
high voltage source. The magazine is movable between an operative, web treating
position and an inoperative, maintenance position. A treater roll is rotatably
135 mounted between the front end plate and the rear end plate below the support tube,
and a pair of idler rolls is rotatably mounted between the front end plate and the
rear end plate below the treater roll such that a web to be treated is guided upwardly
by the idler rolls and wound about the treater roll beneath the electrodes. The
invention is improved in one respect by a cabinet having an integral power supply
140 joined in a high voltage connection to the electrodes for establishing a high voltage
field between the treater roll and the electrodes. The high voltage connection
enables hands-free connection of the electrodes with the power supply when the
electrode magazine is in the operative position, and permits disconnection of the
electrodes from the power supply when the electrode magazine is in the inoperative
145 position. The invention is improved in another respect by slidable structure
enabling the electrode magazine to be slidably mounted on the support tube
between an operative or web treating position, and an inoperative or maintenance
position. The invention is improved still further by an adjustable slide arrangement

150 mounted on the support tube for enabling the front end plate to be slidably movable
relative to the support tube so that the front end plate defines a universal mounting
plate adapted to be connected to various frames of a printing press. The invention
is still further improved by a slide and slot arrangement between the support tube
and the electrode magazine providing sliding movement of the electrode magazine
relative to the support tube, and simultaneously permitting incremental raising and
155 lower of the electrode magazine relative to the support tube to enable adjustment of
a gap between the treater roll and the magazine.

Various other objects, features and advantages of the invention will
be made apparent from the following description taken together with the drawings.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS

160 The drawings illustrate the best mode presently contemplated of
carrying out the invention.

In the drawings:

Fig. 1 is a perspective view of the corona treater embodying the
invention;

165 Fig. 2 is a longitudinal, cross sectional view taken through the corona
treater of Fig. 1;

Fig. 3 is a side elevational view of the corona treater in Fig. 1;

Fig. 4 is a fragmentary, cross sectional view of the front end of the
corona treater shown in Fig. 2;

170 Fig. 5 is a fragmentary, cross sectional view of the rear end of the
corona treater shown in Fig. 2;

Fig. 6 is a perspective view of a high voltage electrode connection
with the electrode magazine in an operative condition; and

175 Fig. 7 is a perspective view of the high voltage electrode connection
with the electrode magazine in an inoperative position.

DETAILED DESCRIPTION OF THE INVENTION

180 Referring now to the drawings, Fig. 1 illustrates a corona discharge device or treater 10 embodying the invention and adapted to be used in conjunction with a printing press 12. In the preferred embodiment, the press 12 takes the form of a label or tag press, but it should be understood that the invention is equally adaptable to other systems involving flexo printing, coating or laminating of
185 flexible webs or substrates.

Corona treater 10 is comprised of an integrated or on-board power supply cabinet 14 with a control panel 16 from which depends a rear end plate 18 and, in parallel relationship thereto, an adjustable front end plate 20 adapted to be connected to label press 12. As will be understood later, the adjustable front end
190 plate 20 defines a salient feature of the invention which enables the universal mounting of the treater 10 to various press constructions. Supported below the cabinet 14 is a fixed electrode support tube 22 upon which a movable electrode magazine 24 having a series of parallel electrodes 25 is slidably disposed between an inoperative or maintenance position shown in Fig. 1, and an operative or web
195 treating position shown in Figs. 2 and 3. A grounded treater roll 26 is mounted for a rotation on a shaft 27 between the end plates 18 and 20 beneath the support tube 22. A pair of web guide or idler rollers 28, 30 is mounted for rotation on respective shafts 32, 34 between the end plates 18 and 20, and lie in space relationship below the treater roll 26. As seen in Fig. 4, a flexible web 36 is guided upwardly by the
200 idler rolls 28, 30 and wound about the treater roll 26 in spaced relationship from the magazine 24 and electrodes 25.

Referring now to Figs. 2 and 3, the power supply cabinet 14 includes a power supply 38 and a high voltage transformer 40 provided with a high voltage wire 42. The wire 42 terminates in a high voltage connection 44 normally enclosed
205 by a high voltage cover plate 46 located behind rear end plate 18. A high voltage connection 44 forms another distinctive feature of the invention which will be more fully described hereafter. At this point, it should be appreciated that the high voltage connection 44 establishes a high voltage field between treater roll 26 and

one or more electrodes 25 with the substrate or web 36 to be treated interposed
210 between electrodes 25 and roll 26. As is well known, the high voltage field
establishes a corona discharge that causes the chemical composition of the material
to be modified which, in turn, improves selected characteristics of the material such
as wettability so that printed matter or coating may be more advantageously
adhered thereto.

215 Support tube 22 passes through appropriate aligned cutouts in the
respective end plates 18 and 20, and is supported by a bracket 47 attached to the
cabinet 14. In the preferred embodiment, support tube 22 has a generally square
cross section except for a rearward exhaust tube portion 48 which is generally
circular in cross section. The exhaust tube 48 facilitates the venting of ozone
220 generated during the corona treatment and cooling for the electrodes thereof.

As best seen in Figs. 1, 4 and 5, a slide track 50 having a groove 52
formed along its length is secured to each side of the support tube 22. Electrode
magazine 24 has a pair of shields 53, 54 which are connected by fasteners 55 to the
sides thereof. The magazine 24 also has a pair of slide rails 56 mounted to the
225 inside, top portion of the shields 53, 54. The rails 56 align with the grooves 52
provided in the slide tracks 50 on support tube 22 and slidably support the electrode
magazine 24 on the support tube 22 above the treater roll 26. A lever locking,
rotatable handle 58 located on the front of the magazine 24 has a latch 60
engagable with a suitable opening in the bottom of the support tube 22 for holding
230 the magazine 24 in the treating position shown in Figs. 2 and 3. When the need to
attend to the web 36 arises, the handle 58 is opened and rotated allowing the
magazine 24 to be slid forwardly (as shown in Fig. 1) opening up an area between
the treater roll 26 and the support tube 22 for webbing the treater 10. A spring-set,
detent pin 62 located on shield 53 of the magazine 24 engages with the support tube
235 22 and prevents magazine 24 from being completely removed. To remove the
entire magazine 24 from the treater 10, the knob of the detent pen 62 must be
pulled out allowing the magazine 24 to slide entirely away from the support tube
22. The slide track and slide rail structure provide a useful feature in slidably

240 supporting the magazine 24 relative to the support tube 22 to allow webbing of the
treater 10 or complete removal of the magazine 24 for maintenance or cleaning of
the electrodes 25.

245 Each slide track 50 is also provided at its forward and rearward ends
with a diagonally extending slot 64 (Fig. 3) through which a shoulder screw 66 is
passed for insertion in support tube 22. Mounted on the front of the support tube
22 is an adjustment device 68 consisting of a rotatable knob 70 having a rod 72
tightly screw threaded into a cover plate 74 on the support tube 22. Slide tracks 50
are moved slightly back and forth and simultaneously up and down via the shoulder
screw 66 riding in the slot 64 when the knob 70 is rotated. As a result, magazine 24
which is attached to support tube 22 via the slide tracks 50 will be incrementally
250 raised or lowered to enable fast, accurate adjustment of the gap 76 between the
magazine 24 and the treater roll 26. This unique feature thus enables a convenient
single point gap adjustment which provides the ability to locate a gap adjustment
gauge (not shown) to set the desired gap adjustment.

255 Referring further to Figs. 3 and 4, the adjustable front end plate 20 is
secured to the shafts 27, 32, and 34 by respective set screws 80, 82 and 84.
Between the bottom of cabinet 14 and the top of support tube 22 is a rod and slide
assembly or linear slide support 86 along which the top of the end plate 20 slides.
Loosening of the screws 80, 82, 84 enables the end plate 20 to be slidably adjusted
longitudinally along the shafts 27, 32 and 34 and slide support 86 such as to a
260 position shown in phantom lines in Fig. 3, at which the screws 80, 82, 84 are again
tightened. The treater roll 26 and the idler rolls 28, 30 may also be shifted into
appropriate alignment along their respective shafts 27, 32, 34 once the end plate 20
has been set. The adjustable end plate 20 provides a universal mounting device
which enables the treater 10 to be easily adapted to various press machine frame
265 variations.

Figs. 6 and 7 show the details of the high voltage connection 44
between the electrodes 25 and the high voltage source 38, 40. Projecting
rearwardly from the fixed rear end plate 18 is a pair of bolts 88 surrounded by non-

conductive spacers 90 and joined at their ends by a connector plate 92. The plate
270 92 has a center opening for receiving a spring loaded screw 94 having a rearward
end connected to high voltage wire 42 and a forward end with an acorn nut 96. The
acorn nut 96 is in electrical contact with a conductive bus bar 98 attached at the end
of the electrodes 25 when the magazine 24 is in the operative or web treating
position as shown in Fig. 6. The acorn nut 96 is disengaged from the conductive
275 bar 98 when the magazine 24 is in the slide out position shown in Fig. 7. The high
voltage connection 44 permits a fast, simple electrical connection between the
electrodes 25 and the high voltage source 38, 40 which can be easily disconnected
from the treater 10 making removal of the electrode magazine 24 safer and quicker.

It should be appreciated that the present invention provides a corona
280 treater 10 which incorporates an on-board power supply saving the expense of
installing a separate corona treating station and a separate power supply. The
universal end plate 20 also enables a quick mounting arrangement to a wide variety
of presses with a minimum of set up time. The slidable mounting of the electrode
magazine 24 permits efficient webbing and maintenance. The front access, single
285 point gap adjustment allows users to quickly and conveniently set the gap between
the electrodes 25 and the treater roll 26. The high voltage connection 44 creates a
hands-free, safer means by which the electrode magazine 24 may be removed
without disabling a permanent connection of the high voltage wire 42.

While the invention has been described with reference to a preferred
290 embodiment, those skilled in the art will appreciate that certain substitutions,
alterations and omissions may be made without departing from the spirit thereof.
Accordingly, the foregoing description is meant to be exemplary only and should
not be deemed limitative on the scope of the invention.